The “ Metropocentre ”

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Fig. 1 *The Métropocentre in its transportation box.*

Historical context

Shooting competitions have been for a long time popular in Switzerland and Germany. In Switzerland, they were held only at the local level during the XVIIIth and the first quarter of the XIXth centuries. The first national marksmen's festival gathering a large number of men coming from all parts of Switzerland (“Eidgenössisches Schützenfest”) was held in 1824, and then every three years or so, each time in a different part of the country. Banquets were served, beer and wine flowed freely, patriotic speeches were made. These festivals played an important role[1] in the awakening of a national feeling, leading to the formation of modern Switzerland, which at last became a democratic, federal State in 1848.

The targets at which the marksmen fired were usually round or squares, one to two meters across, white, with a black, removable cardboard disc at the centre, without any markings.

For large competitions, it was important to find the means to evaluate quickly, precisely and impartially the score of each marksman. Scoring machines[2], mostly bulky and heavy[3], were built with the purpose of measuring the radial distance between a hole made by a bullet in the black cardboard disc and its centre, without needing to know the position of the centre.

The Métropocentre was to be a light, easy to use, portable, inexpensive (as claimed by the inventor) machine that a modest shooting club could afford.

Description and use

The Métropocentre in its transportation box is shown on fig. 1, with a rifle[4] giving the scale, and ready for use, with a well used target, on fig. 2. A conical plug is inserted onto a steel pin (Fig. 3) through the hole made by the bullet. A cursor sliding along a ruler graduated in millimeters is brought into contact with the rim of the target.

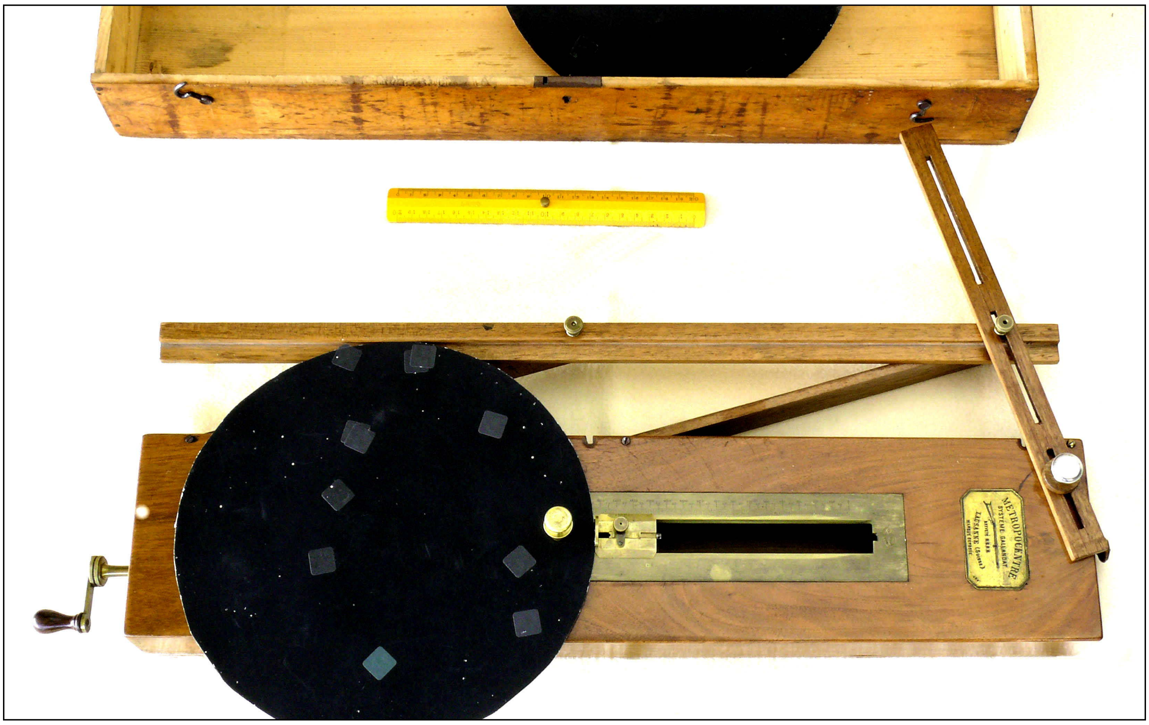

Fig. 2 *The Métropocentre in use.*

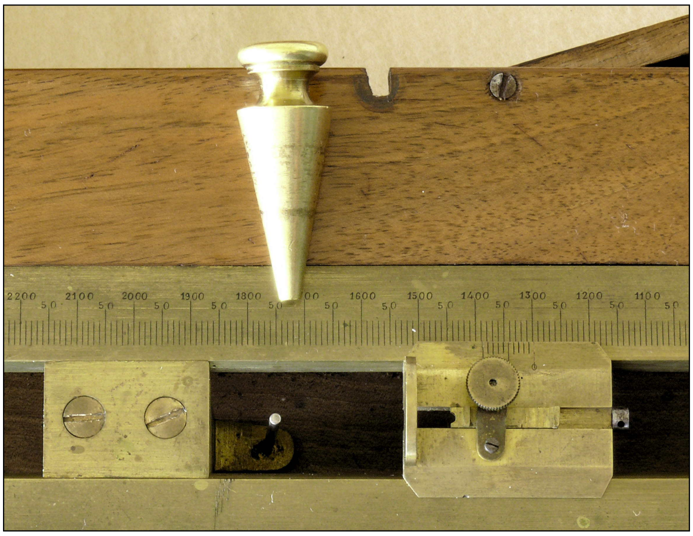

Fig. 3 *Pin, conical plug and cursor.*

Initially, two distances are to be carefully adjusted. Both settings are best made with a disc of radius R, with a hole right at the centre.

1. The target is assumed to be a perfect circle of radius R. A wooden bar is taken out of the body of the Métropocentre (Fig. 4) and then moved parallel to the longitudinal axis of the Metropocentre, along which a steel pin lies, and set at a distance R from the axis. If the rim of the target touches the bar, its centre lies over the longitudinal axis.

2. The above-mentioned pin protrudes from a carriage moved by a fine pitched screw, hidden in the body of the machine, which can be turned by a crank (Fig. 2, left). The pin is set at such a distance from the beginning of the ruler that the reading is zero for a target with a hole at the centre.

Once the machine is ready, the measurements are quickly made. The position of the sliding cursor in contact with the rim gives the distance between the unmarked centre of the target and the bullet hole with a resolution of 0.1 mm, with the help of the vernier on the edge of the cursor.

Fig. 4 *Rear view.*

A French patent[5] granted in 1881 to the Sieur Gallandat[6] is at the same time an exact and detailed description of the Métropocentre, with a 1:1 scale mechanical drawing including all details, and an users' manual. Two differences between the apparatus described in the patent and our Métropocentre can be seen: the knurled knob moving the pin along the ruler, too hard to turn, has been transformed into a crank, and a triangulating bar has been added to confer rigidity and stability to the position of the movable parallel bar.

Specifications

Transportation box (softwood): 618 x 148 x 80 mm^3

Métropocentre (fruitwood, brass, steel): 580 x 128 x 48 mm^3 (closed)

Weight: 2.8 kg (including the box)

Target diameter: 150 mm to 600 mm

Rifle calibre: 4 mm to 17 mm

Geometrical considerations

The geometry is shown in Fig. 5.

B is a straight line parallel to the axis **Or**, at a distance R from **Or**. It represents the movable parallel bar.

If a disc of radius R, with a hole centred on point **P**, somewhere between the centre **C** and the rim, is positioned in such a way that **P** lies along **Or**, then its centre **C** is also on **Or**. The tangent at **S'** is perpendicular to **Or.**

Let us fix **P** somewhere between the centre and the rim. Then the distance **O–S'** is equal to the distance **CP**, to be measured. If **P** is at the centre of the disc (dashed line), then the reading is $r = 0$; if **P** is on the rim, $r = R$.

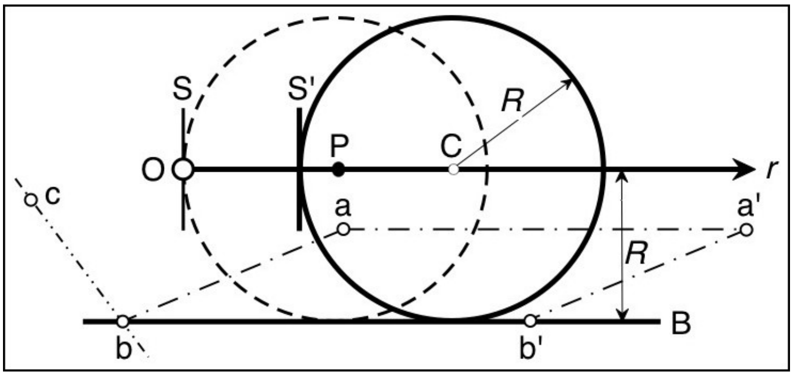

Fig. 5 *Geometry.*

In the actual construction, the wooden bar **B** is supported by two parallel arms **a-b** and **a'-b'**. The resulting parallelogram ensures that **B** remains parallel to the instrument axis when *R* is changed. Both arms are free to turn about the points **a** and **a'**, on the edge of the box (Fig. 4). In the original model, as described in the patent, tightening the nuts at points **b** and **b'** was deemed sufficient to set the machine for use. The rigidifying arm **c-b** is a later addition.

Errors

There are several possible sources of errors.

Irregularities on the rim of the cardboard target, protuberances or indentations due for example to careless handling, introduce an error on the position of the cursor. During the XIXth century, the cardboard discs were cut on a specialised machine[3] by a rotating knife, ensuring the required precision of the new targets.

The steel pin (only 2 mm dia.) is somewhat flexible. When bringing the cursor in contact with the rim of the target, don't push too hard!

The bullet makes a jagged hole in the cardboard: the conical plug averages the irregularities.

Geometrical errors on the longitudinal position of the pin, on the distance between the machine axis and the parallel ruler as well a possible defect of parallelism between them alter the readings.

Even if the resolution of the readings is 0.1 mm, such a precision and reproducibility seems illusory and not necessary.

Markings

The brass label (Figs. 6) shows the name of the apparatus (Métropocentre), a reference to the inventor (Système Gallandat), another to a patent[5] (Breveté S.G.D.G)[7], the name of the town where the inventor was living (LAUSANNE Suisse), an indication 'Registered Trademark' (Marque Déposée), and what I assume to be a serial number (494). A rifle[8] is shown in profile.

The name of the machine is an erudite one, formed by the fusion of three words borrowed from ancient Greek: METR–OPO-CENTRE. METR (from the noun "metron") conveys the idea of measurement. OPO (from the adverb "opoi") means "where" (implying motion, as in the German "wohin"). Now, the pitfall: the noun "kentron" (transcribed as CENTRE) refers to something sharp, such as a goad to drive cattle, the sting of an animal or the point of a spear – here the bullet fired by the rifle. CENTRE has thus nothing to do with the centre of the target! "Measure – where – bullet" describes concisely and precisely the purpose of the machine.

The logo of the (still unidentified with certitude) maker (C. B. & Cie A LYON)[9] is stamped on the brass ruler (Fig. 7).

Fig. 6 *Label (62.5 x 38 mm²).*

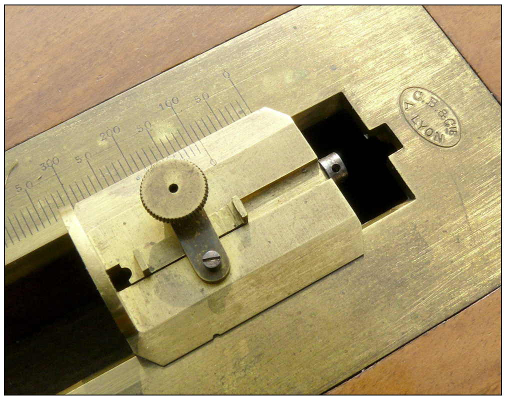

Fig. 7 *Cursor and maker's stamp.*

Concluding remarks

The Métropocentre I have described here has been for many decades, probably for more than a century, the property of the "Cercle des Arquebusiers Campagnards de Vevey", a rifle shooting club, where I have seen it used for many years, until about 1980, when it was superseded by electronic scoring.

I do not know how many Métropocentres were built and sold. The only other known exemplar (No 499) is in the collection of a Museum in Bern[3]. It has been heavily modified – to the point of mutilation – to allow the measurement of small diameter targets (up to 150 mm).

Acknowledgements

I should like to thank the "Archives de la Ville de Lausanne " and their Director, Mr. F. Sardet, for providing me with a copy of the patent and the few indications we have about the life of Jules Gallandat. My thanks also go to the Director of the Schützenmuseum in Bern, Mr. F. Piller, who allowed me to examine closely the Métropocentre in their possession.

For the etymology of the word Métropocentre, I am indebted to my colleague Claude Calame, professor of Greek at UNIL, who didn't need five minutes to solve a mystery, the solution of which had escaped me (and several generations of members of my shooting club) for many decades.

Finally, many thanks to my colleague at EPFL Prof. D. Schwarzenbach for proofreading the manuscript and suggesting many improvements.

Notes and References:

1. Gilliane Kern, 'En quête d'une identité nationale', (Université de Neuchâtel, Mémoire de licence, 2005)

2. The French name is "Machine à échantillonner". The German one is "Abstechmaschine".

3. I have seen such machines in 2003 at the Schweizerisches Schützenmuseum Bern, Bernastrasse 5, CH-3005 Bern.

4. The rifle laying on the box is my Schmidt-Rubin (caliber 7.5 mm), Model 1911. It was the successor of the Vetterli. This model and its (somewhat shortened) successors were the Swiss infantry rifles until about 1970, and were the principal weapons used to fire at the targets evaluated by the Métropocentre.

5. "Brevet d'Invention sans garantie du gouvernement" No 143,189, dated June 2, 1881, titled "Mémoire descriptif à l'appui d'une demande de Brevet d'invention pour un Métropocentre", granted for 15 years to the Sieur Gallandat (Jules). The first Swiss patent was granted in 1888.

6. Not much is known about the inventor, Jules Samuel Louis Gallandat, born 1820 or 1821 in Rovray, a small village in the northern, rural part of Canton de Vaud (Switzerland). Nothing is known about his education and how he became a surveyor, making maps of towns (Vevey, 1870) and cadastral maps of localities (Morges, St-Légier, etc.) not far from Lake Geneva. Living in the capital, Lausanne, from 1859 to 1866, he got married and had two sons. He is again recorded in Lausanne in 1880. With an Academy in Lausanne, there was no shortage of people knowledgeable about ancient Greek, able to suggest an erudite name for the machine he invented in 1881. He left (or died?) in 1883.

7. S.G.D.G.: "Sans (without!) Garantie Du Gouvernement".

8. It's a Vetterli (calibre 10.4 mm), a repeating, breech loading rifle produced for the Swiss army from 1869 to 1889. The one shown is a "Stutzer", with double set trigger and finger hook on the trigger cover, a weapon reserved for sharpshooters.

9. Could it be "Cochet et Billot", known as makers of balances? According to Frank Marcelin, *Dictionnaire des fabricants français d'instruments de mesure du XV^e^ au XIX^e^ siècle* (Aix-en-Provence 2004), Cochet and Billot worked in partnership from 1879 to 1883, at Chalon-sur-Saône, 127 km north from Lyons. The timing is right (patent granted in 1881), but there is a problem with the location.

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